Transmission and Distribution Line, Underwriting Considerations

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Munich RE

NOT IF, BUT HOW

Image: Munich Re

Agenda

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General Introduction

01

Image: Munich Re

General Introduction

Transmission or distribution lines carry electric energy from one point to another in an electric power system

Typically, high-voltage lines are classified as transmission lines, and mid- and low-voltage lines as distribution lines. High voltage transmission lines are usually more robust than middle and low voltage distribution lines

Underground

Source : Underground Cable

Overhead

Source : Overhead transmission

Submarine

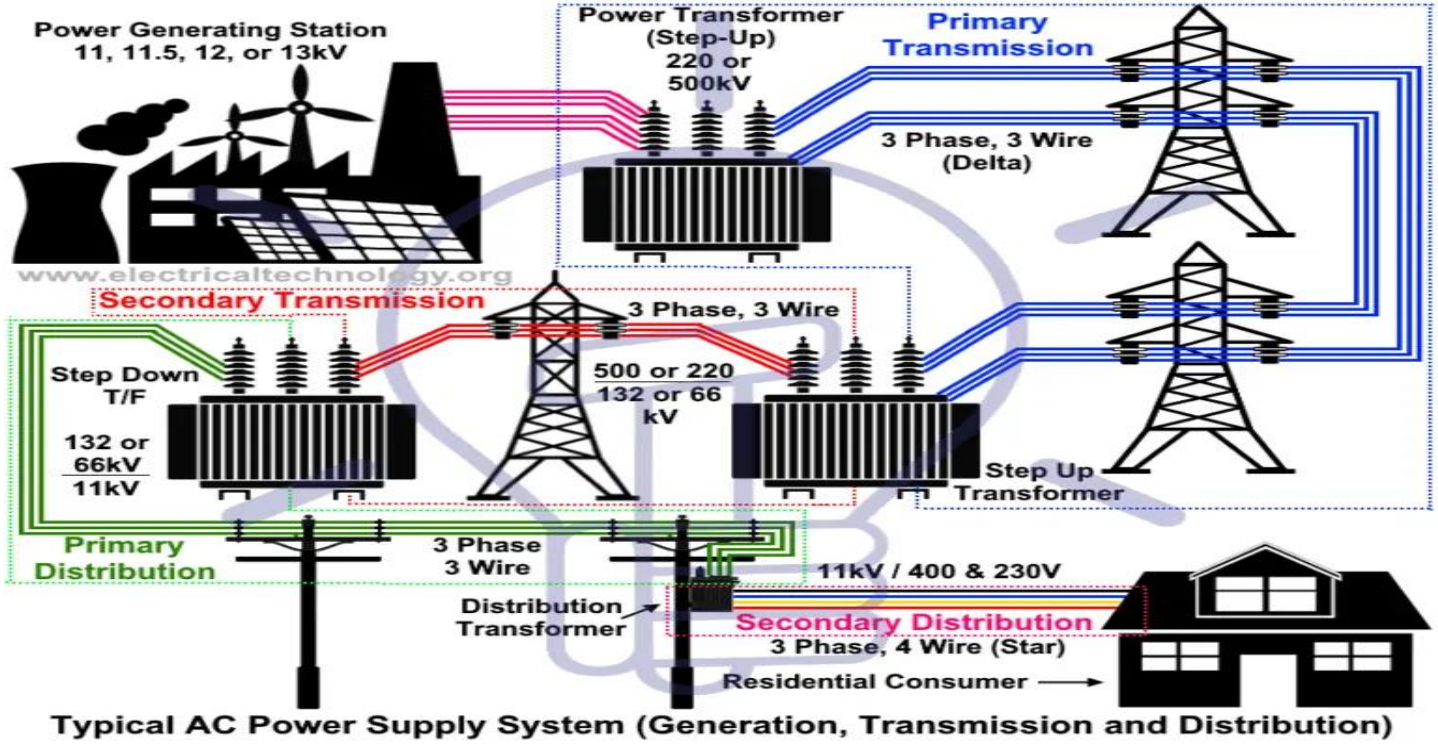
Source : Submarine cable

General Introduction

From generation to distribution

General Introduction

Transmission vs Distribution



Source : *www.electricaltechnology.org/2013/05/typical-ac-power-supply-system-scheme.html*

General Introduction

Definition

Power station: is an industrial facility that generates electricity from primary energy. Most power plants use one or more generators that convert mechanical energy into electrical energy in order to supply power to the electrical grid for society's electrical needs. The exception is solar power plants, which use photovoltaic cells (instead of a turbine) to generate this electricity.

Source : Primary energy flow

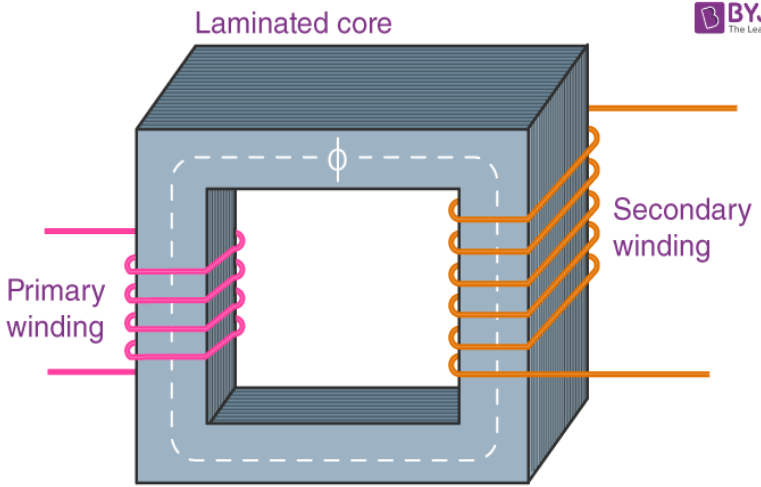
Transformer: A transformer is a device used in the power transmission of electric energy. The transmission current is AC. It is commonly used to increase or decrease the supply voltage

Step-up Transformer: They are used between the power generator and the power grid. The secondary output voltage is higher than the input voltage.

Step-down Transformer: These transformers are used to convert high-voltage primary supply to low-voltage secondary output.

General Introduction

Transformers



Voltage Transformation Ratio

$$\frac{E_1}{N_1} = \frac{E_2}{N_2} = k$$

K is called the voltage transformation ratio, which is a constant.

Case 1:If $N_2 > N_1$, $K>1$, it is called a step-up transformer.

Case 2: If $N_2 < N_1$, $K<1$, it is called a step-down transformer.

Power transformers available in the market have various ratings ranging from 400kV, 200kV, 66kV, and 33kV

Whereas distribution transformers ratings range from 11kV, 6.6kV, 3.3kV, 440v, and 230 volts.

General Introduction

Substations

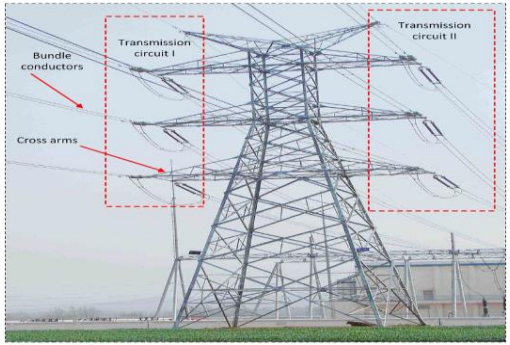
A substation is a part of an electrical generation, transmission, and distribution system. Substations transform voltage from high to low, or the reverse, or perform any of several other important functions. Between the generating station and consumer, electric power may flow through several substations at different voltage levels.

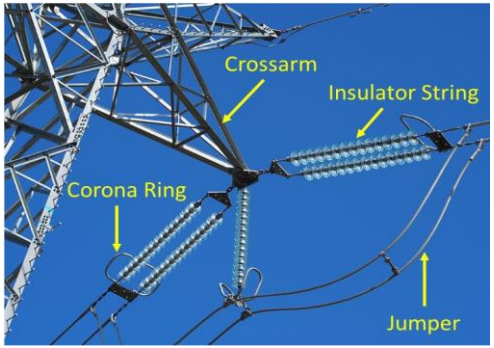
Source : Substation

General Introduction

Components of transmission line

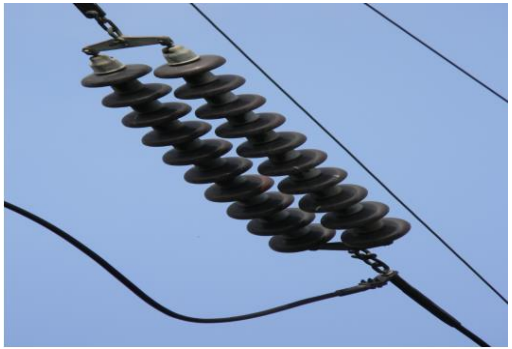
Bundled Conductor

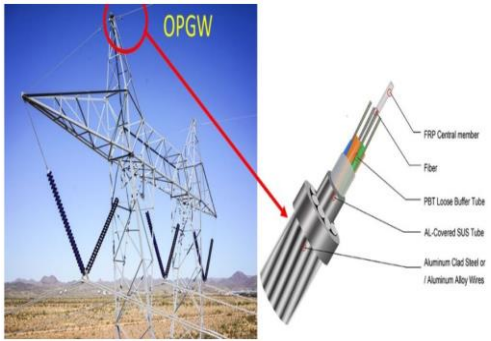




Crossarm, corona Ring, Jumper

Insulators



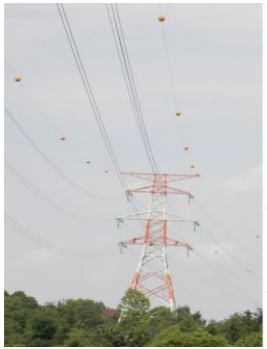


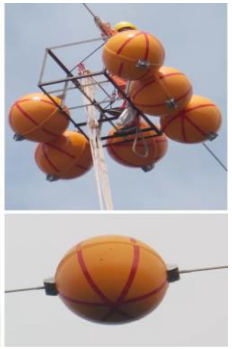
Optical Fiber Ground Wire

General Introduction

Components of transmission line

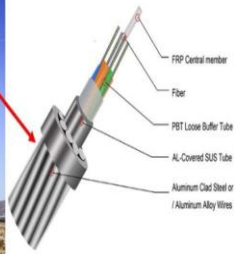
Vibration Damper





Power Line Marker

Spacer



Optical Fiber Ground Wire

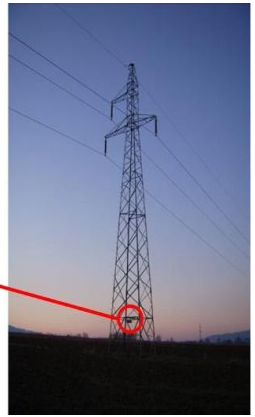
General Introduction

Components of transmission line

Power Line Marker

Anti-climbing fencer

Source : Components of transmission line



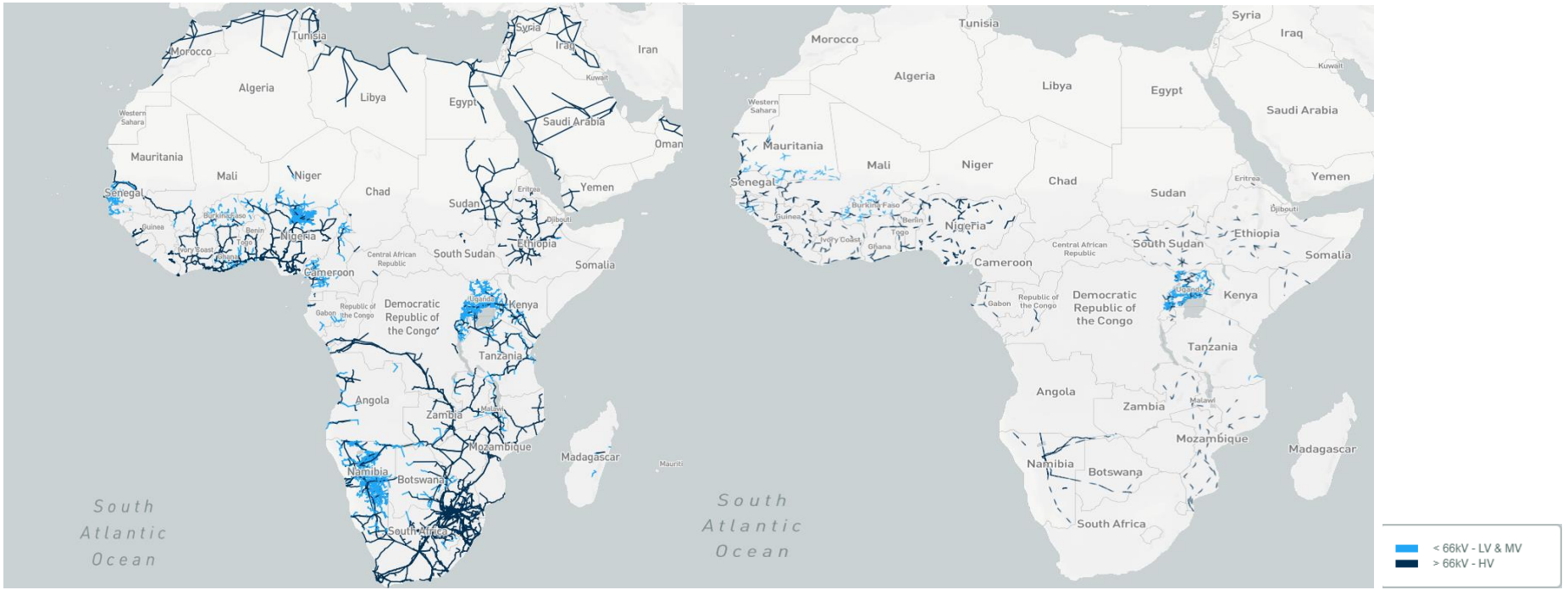
Danger Plate

General Introduction

Africa grid overview

Existing

Planned



Source : [Africa grid from the world bank]

Construction Process

02

Image: Munich Re

Construction Process

Esia

- Environmental compatibility
- Low impact on the nature and living mode
- Consideration of natural or man-made obstacle
- Possible locations of transformer substations

Detailed Planning

- Recording
- Assessing the features of the terrain

Detailed design

- Geotechnical survey
- Topological conditions
- Study of wind
- Transmission line cable length calculation

Construction phases

- Tree-felling work on routes running through forests
- Road Building work
- Site facilities –every 20 Km
- Foundations
- Pylon assembly
- Cables hanging
- Tests and acceptance
- Recultivation

Pylon Assembly

Crane

Source *: IMIA WGP 69 (10)*

Helicopter

Source *: IMIA WGP 69 (10)*

Insurance Aspects

03

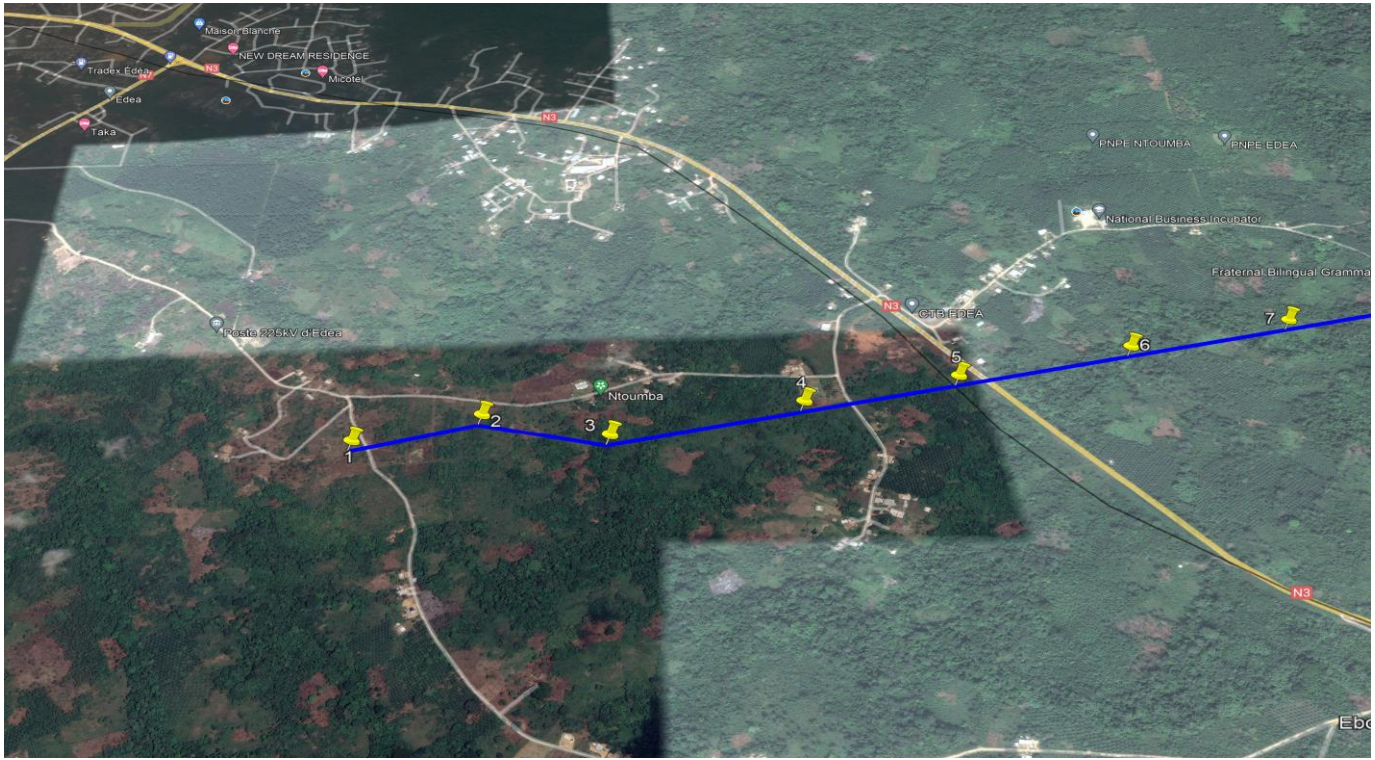
Image: Munich Re

Insurance Aspect
Underwriting Information

- Location
- Detailed scope of works ESIA report
- Contractors name
- Geotechnical soil reports
- Breakdown of value
- Schedule
- Route mapping

Insurance Aspect

Route Mapping



Souce : Munich Re

Insurance Aspect
Risk Assessment

- Nat cat exposure
- Ground conditions, type of foundations
- Experience of the contractor
- Environmental and social impact of the project
- Natural or man made obstacles (lakes, mountains, cities, conservation areas, etc..)

Insurance Aspect

Loss Scenarios

Natural Hazards

- Earthquake
- Wind storms
- Flood
- Landslides and avalanches
- Lightning
- Subsidence

External Hazards

- Aircraft Impact
- Bush fire
- Terrorism&SRCC
- Landslides and avalanches
- Lightning
- Subsidence

Project intrinsic hazards

- Fire
- Faulty design and workmanship
- Constructions operations

Insurance Aspect

PML Calculations

Location : Madagascar

Length : 100 Km

SI (Transmision line) : 100 millions USD

Scenario : Cyclone event which destroys pylons , 40% of losses

		Sum Insured(USD)	PML%	PML (USD)
Contract works	Material Damages	100,000,000	40%	40,000,000
	Escalation %	6%		6,000,000
Policy Extensions	Removal of Debris	10,000,000	100%	10,000,000
	Expert fees	2,500,000	100%	2,500,000
	Expenditing Expenses	2,000,000	100%	2,500,000
	Third part Liability	2,500,000	100%	2,500,000
	Other	2,500,000	100%	2,500,000
	Total	***125,500,000***		***66,000,000***

Insurance Aspect

Mandatory Clauses

- MR110- Safety measures with respect to precipitation, flood and inundation
- MR112- Fire fighting facilities and fire safety on construction sites
- MR114- Serial Losses
- MR 121- piling Foundation and retaining wall works

Claims examples

04

Image: Munich Re

Claims examples

Buckled 220 kV pylons following Windstorm Emma about 20 items on the ground

Claims examples

Danger from landslide/mudflow

Erosion of foundation following flooding

Thank you for your attention!

Munich RE

NOT IF, BUT HOW

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